

FCC TEST REPORT

Applicant	Lenovo (Shanghai) Electronics Technology Co., Ltd.
Address	Section 304-305, Building No. 4, # 222, Meiyue Road, China (Shanghai) Pilot Free Trade Zone

Manufacturer or Supplier	Lenovo PC HK Limited
Address	23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong, P.R.China
Product	Wireless Charging Dock for Lenovo Smart Clocks
Brand Name	Lenovo
Model	Lenovo SE-A61UW
Additional Models & Model Difference	N/A
Date of tests	May 14, 2021 ~ Jun. 04, 2021

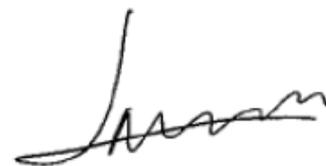
The submitted sample of the above equipment has been tested for according to the requirements of the following standards:

CFR-2021 Title 47 FCC Part 15 Subpart B, Class B

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Tested by Lucas Chen
Project Engineer / EMC Department

Approved by Madison Luo
Assistant Manager / EMC Department

Date: Jun. 17, 2021

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Test Report No.: FS2104WDG0474

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
FS2104WDG0474	Original release	Jun. 17, 2021



1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD			
Standard Section	Test Item	Result	Remark
CFR-2021 Title 47 FCC Part 15 Subpart B, Class B	Conducted test	PASS	Meets limits minimum passing margin is -4.57dB at 13.27200 MHz
	Radiated Emission Test (30MHz ~ 1GHz)	PASS	Meets limits minimum passing margin is -3.43dB at 255.197MHz

1.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emission test	0.15MHz ~ 30MHz	+/- 3.05 dB
Radiated emissions	30MHz ~ 1GHz	+ /- 4.00 dB



2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Wireless Charging Dock for Lenovo Smart Clocks
MODEL NO.	Lenovo SE-A61UW
ADDITIONAL MODELS	N/A
FCC ID	O57SEA61UW
POWER SUPPLY	Power by Lenovo Smart Clock 2 (Wireless Charging Output: 10W, Max.; USB-A Output: (DC 5V 2A, Max.); Wireless Charging Output (5W) + USB-A Output: (DC 5V 0.5A))
CABLE SUPPLIED	N/A
THE HIGHEST OPERATING FREQUENCY	Below 108MHz (111KHz-150KHz for Wireless Charging)

NOTES:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions, but only the worst case was shown in test report.
3. Please refer to the EUT photo document (Reference No.: 2104WDG0474) for detailed product photo.
4. The product is matched with two types of Smart Clock (see below list) for all the tests, but only the worst case was showed in test report.

Differentia (Smart Clock)	1# Smart Clock	2# Smart Clock
DDR Chips	M15T4G16256A BRAND: ESMT	MT41K256M16TW BRAND: Micron
Adapters	Made by Chenyang Electronics	Made by ACBEL ELECTRICAL



2.2 DESCRIPTION OF TEST MODES

The EUT was tested under the following modes, the final worst mode were marked in boldface and recorded in this report.

FOR CONDUCTED EMISSION TEST:

Description of Test Mode	Test Voltage	Smart Clock
Wireless Charging	Power by Lenovo Smart Clock 2	1# Smart Clock 2# Smart Clock
USB-A Output (DC 5V 2A)		
Wireless Charging (5W) + USB-A Output(DC 5V 0.5A)		

FOR RADIATED EMISSIONS TEST:

Description of Test Mode	Test Voltage	Smart Clock
Wireless Charging	Power by Lenovo Smart Clock 2	1# Smart Clock 2# Smart Clock
USB-A Output (DC 5V 2A)		
Wireless Charging (5W) + USB-A Output(DC 5V 0.5A)		

2.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	1# Smart Clock	Lenovo	Lenovo CD-24502F	N/A	N/A
2	2# Smart Clock	Lenovo	Lenovo CD-24502F	N/A	N/A
3	ADAPTER 1	Lenovo (chenyang)	AD18W2002	N/A	N/A
4	ADAPTER 2	Lenovo (Acbel)	AD18W2002	N/A	N/A
5	iPhone 11	Apple	MWN02CH/A	N/A	N/A
6	iPhone X	Apple	MQA52CH/A	N/A	N/A
7	iPhone 12 Pro	Apple	A2408	N/A	N/A
8	Receiver Load	N/A	N/A	N/A	N/A

NO.	DESCRIPTION OF THE ABOVE SUPPORT UNITS
1-2	N/A
3	Unshielded, Non-detachable, 150cm
4	Unshielded, Non-detachable, 150cm
5-8	N/A



3 EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

TEST STANDARD: FCC Part 15, Subpart B (Section: 15.107)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

- NOTES:**
- (1) The lower limit shall apply at the transition frequencies.
 - (2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
 - (3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

3.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR7	101494	Mar. 07,22
Artificial Mains Network	Rohde&Schwarz	ENV216	101173	Mar. 07,22
Artificial Mains Network	Rohde&Schwarz	ESH3-Z5	100317	Mar. 07,22
Voltage probe	SCHWARZBECK	TK 9421	TK 9421-176	Sep. 17,21
Test software	ADT	ADT_Cond_V7.3.7	N/A	N/A

- NOTES:**
1. The test was performed at Shielded Room 553.
 2. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.



3.1.3 TEST PROCEDURE

The basic test procedure was in accordance with ANSI C63.4:2014 amended as per ANSI C63.4a:2017.

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20dB) were not recorded.

NOTES:

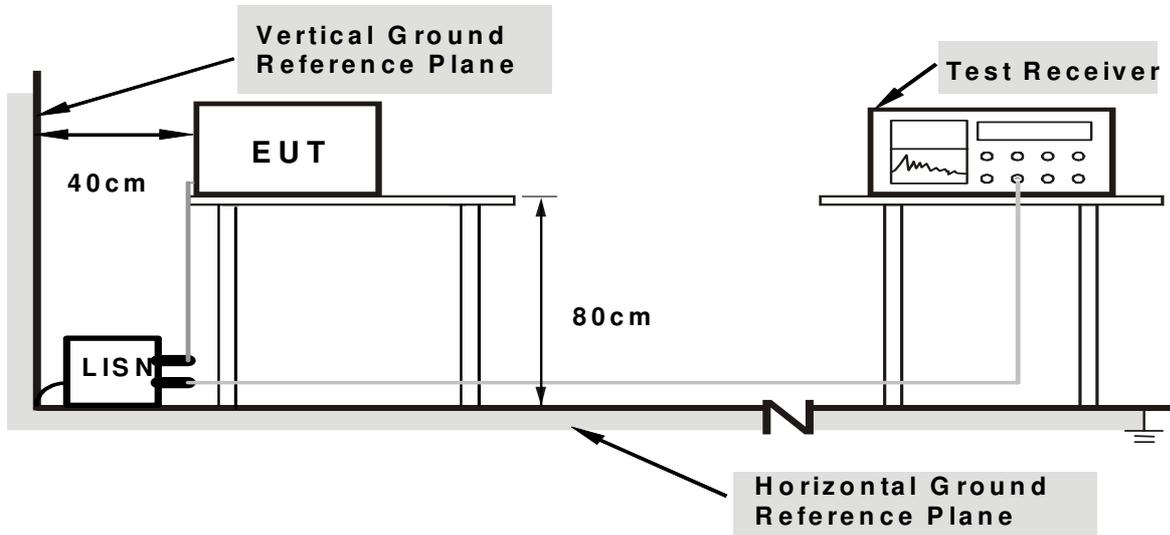
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

3.1.4 DEVIATION FROM TEST STANDARD

No deviation.



3.1.5 TEST SETUP



- Note:**
1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.

3.1.6 EUT OPERATING CONDITIONS

- a. Turned on the power of all equipment.
- b. EUT was operated according to the type description in manufacturer's specifications or the User's Manual.

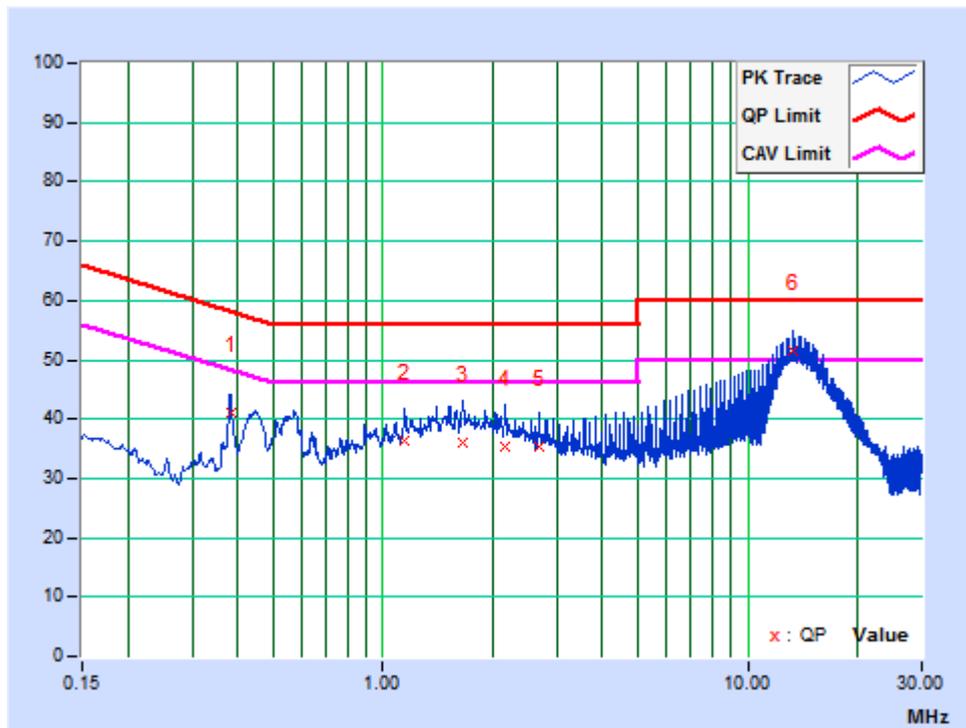


3.1.7 TEST RESULTS

TEST MODE	See section 2.2	6DB BANDWIDTH	9 kHz
TEST VOLTAGE	See section 2.2	PHASE	Line (L)
ENVIRONMENTAL CONDITIONS	25deg.C, 64% RH	TESTED BY	Wink Wang

No.	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.38175	9.85	31.24	25.50	41.09	35.35	58.24	48.24	-17.15	-12.89
2	1.14900	9.83	26.44	17.77	36.27	27.60	56.00	46.00	-19.73	-18.40
3	1.65750	9.84	26.08	15.34	35.92	25.18	56.00	46.00	-20.08	-20.82
4	2.17050	9.85	25.42	16.33	35.27	26.18	56.00	46.00	-20.73	-19.82
5	2.67900	9.86	25.57	17.88	35.43	27.74	56.00	46.00	-20.57	-18.26
6	13.27200	10.08	41.50	35.35	51.58	45.43	60.00	50.00	-8.42	-4.57

REMARKS: The emission levels of other frequencies were very low against the limit.

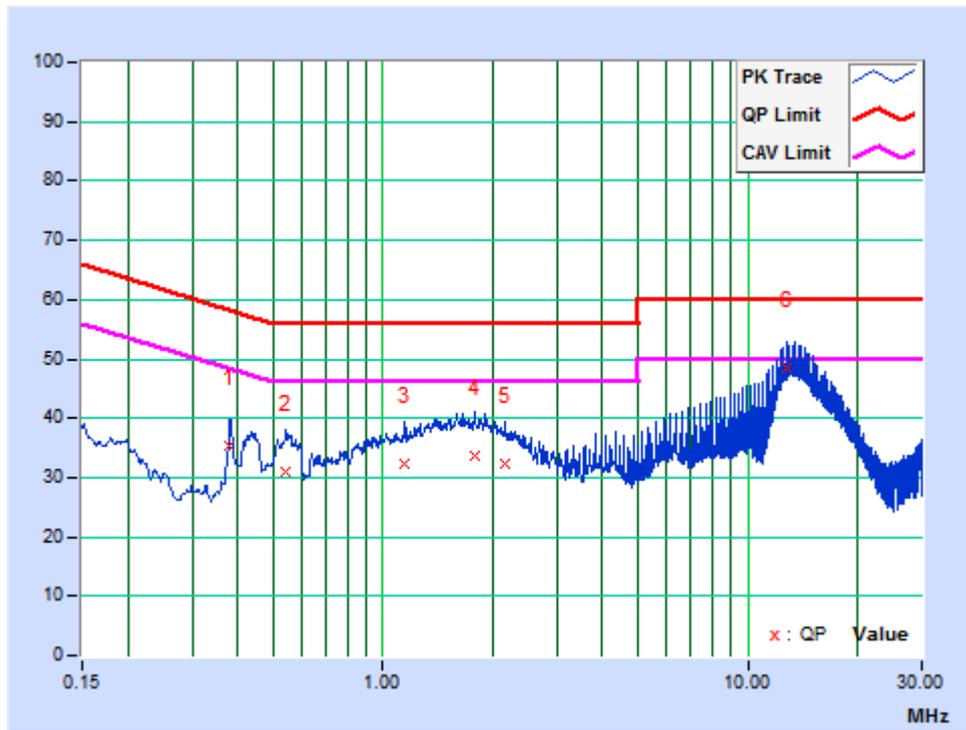




TEST MODE	See section 2.2	6DB BANDWIDTH	9 kHz
TEST VOLTAGE	See section 2.2	PHASE	Neutral (N)
ENVIRONMENTAL CONDITIONS	25deg.C, 64% RH	TESTED BY	Wink Wang

No.	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.38159	9.79	25.67	20.89	35.46	30.68	58.24	48.24	-22.79	-17.57
2	0.54071	9.80	21.33	14.30	31.13	24.10	56.00	46.00	-24.87	-21.90
3	1.15058	9.80	22.69	13.99	32.49	23.79	56.00	46.00	-23.51	-22.21
4	1.78575	9.81	23.77	14.68	33.58	24.49	56.00	46.00	-22.42	-21.51
5	2.16830	9.81	22.61	13.92	32.42	23.73	56.00	46.00	-23.58	-22.27
6	12.76125	10.06	38.59	32.49	48.65	42.55	60.00	50.00	-11.35	-7.45

REMARKS: The emission levels of other frequencies were very low against the limit.





3.2 RADIATED EMISSION MEASUREMENT

3.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

TEST STANDARD: FCC Part 15, Subpart B (Section: 15.109)

Emissions radiated outside of the specified bands, shall be according to the general radiated limits as following:

Radiated Emissions Limits at 10 meters (dBµV/m)				
Frequencies (MHz)	FCC 15B, Class A	FCC 15B, Class B	CISPR 22, Class A	CISPR 22, Class B
30-88	39	29.5	40	30
88-216	43.5	33.1		
216-230	46.4	35.6	47	37
230-960				
960-1000	49.5	43.5		

Radiated Emissions Limits at 3 meters (dBµV/m)		
Frequencies (MHz)	FCC 15B, Class A	FCC 15B, Class B
30-88	49.5	40
88-216	54	43.5
216-230	56.9	46
230-960		
960-1000	60	54
1000-3000	Avg: 60	Avg: 54
Above 3000	Peak: 80	Peak: 74



FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

- Notes: (1) The lower limit shall apply at the transition frequencies.
(2) Emission level (dBuV/m) = 20 log Emission level (uV/m).
(3) All emanation from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.



3.2.2 TEST INSTRUMENTS

FREQUENCY RANGE BELOW 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESU26	100005	May 13, 22
EMI Test Receiver	Rohde&Schwarz	ESR7	101564	Mar. 07,22
Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	9168-555	Dec. 11, 21
Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	9168-554	Jan. 09, 22
Preamplifier	EMCI	EMC1135	980378	Mar. 13,22
Preamplifier	EMCI	EMC1135	980423	Mar. 13,22
10m Semi-anechoic Chamber	CHANGLING	21.4m*12.1m*8.8m	NSEMC006	May 23,22
Test Software	ADT	ADT_Radiated_V8.7.07	N/A	N/A

- NOTES:**
1. The test was performed in 10m Chamber.
 2. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
 3. The FCC Site Registration No. is 749762.

FREQUENCY RANGE ABOVE 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
Horn Antenna	ETS-Lindgren	3117	00085519	Nov. 06, 21
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170147	May 09, 22
Signal and Spectrum Analyzer	Rohde&Schwarz	FSV40	101003	Feb. 24,22
Broadband Preamplifier (1~18GHz)	SCHWARZBECK	BBV9718	266	May 08,22
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Jan. 10,22
Test Software	ADT	ADT_Radiated_V8.7.07	N/A	N/A

- NOTES:**
1. The test was performed in 10m Chamber.
 2. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
 3. The FCC Site Registration No. is 749762.



3.2.3 TEST PROCEDURE

The basic test procedure was in accordance with ANSI C63.4:2014 amended as per ANSI C63.4a:2017.

<Frequency Range below 1GHz>

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter semi-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1GHz.

NOTES:

1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
3. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) (if the raw value not contains the amplifier)
4. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain(dB) (if the raw value contains the amplifier)
5. Margin value = Emission level – Limit value



<Frequency Range above 1GHz>

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna can be varied from one meter-to four meters, the height of adjustment depends on the EUT height and the antenna 3dB beamwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. The bore sight should be used during the test above 1GHz.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test receiver/spectrum was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

NOTES:

1. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.
2. For measurement of frequency above 1000 MHz, the EUT was set 3 meters away from the receiver antenna.
3. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
4. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) (if the raw value not contains the amplifier)
5. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain(dB) (if the raw value contains the amplifier).
6. Margin value = Emission level – Limit value

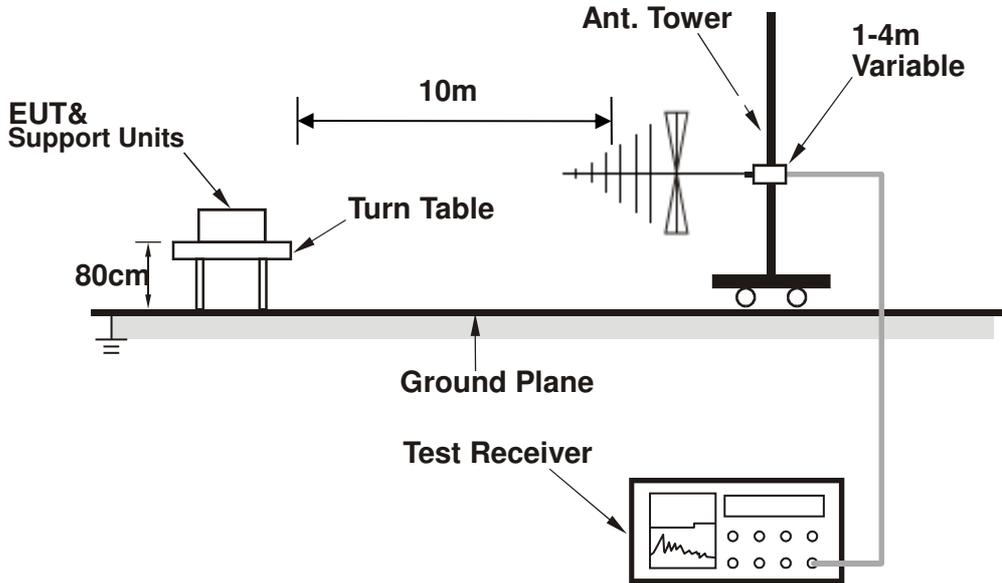
3.2.4 DEVIATION FROM TEST STANDARD

No deviation.

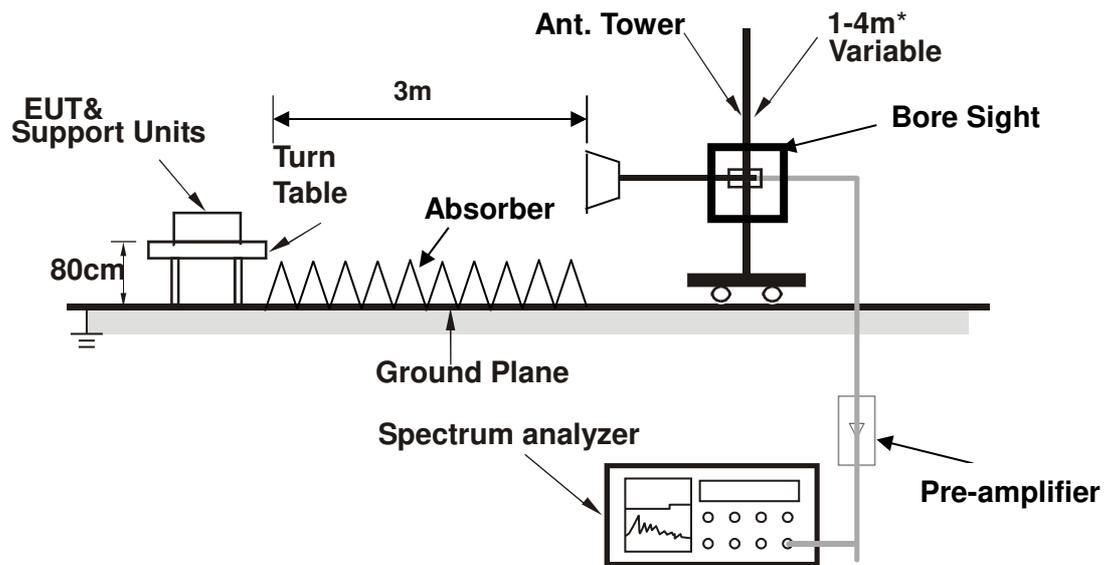


3.2.5 TEST SETUP

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



* : depends on the EUT height and the antenna 3dB beamwidth both, refer to section 7.3 of CISPR 16-2-3.

3.2.6 EUT OPERATING CONDITIONS

See items 3.1.6.

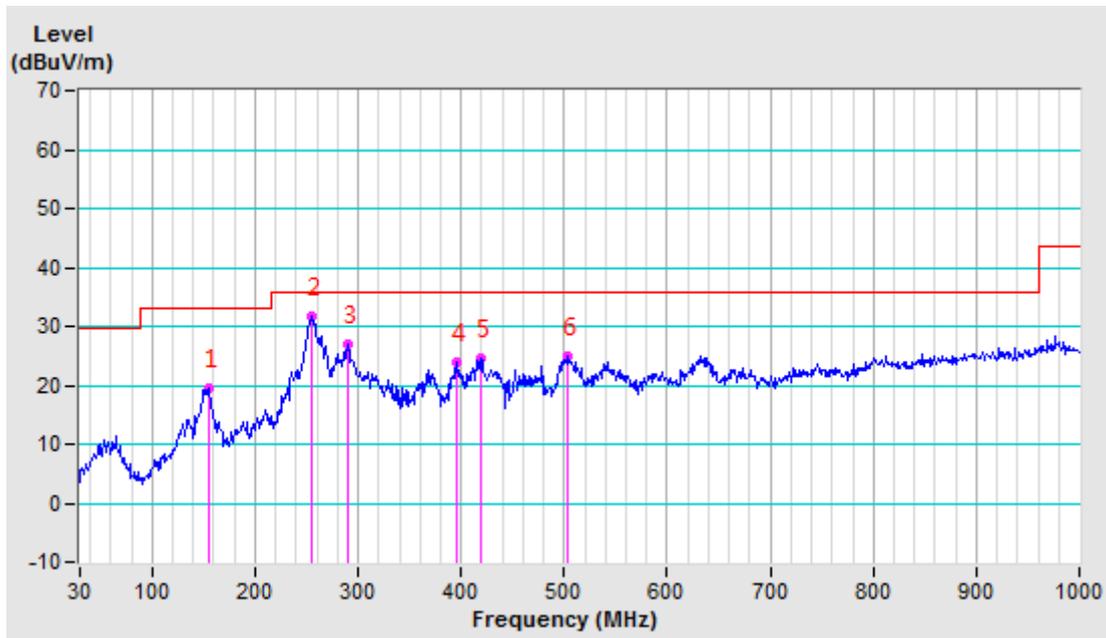


3.2.7 TEST RESULTS

TEST MODE	See section 2.2	FREQUENCY RANGE	30-1000MHz
TEST VOLTAGE	See section 2.2	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	22deg. C, 62% RH	TESTED BY: Bryant	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 10 M								
No.	Freq. (MHz)	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)
1	154.766	-20.02	39.54	19.52	33.10	-13.58	400	5
2	254.434	-21.23	52.95	31.72	35.60	-3.88	400	25
3	289.233	-19.71	46.60	26.89	35.60	-8.71	200	43
4	394.841	-17.04	40.88	23.84	35.60	-11.76	200	50
5	419.213	-16.24	40.89	24.65	35.60	-10.95	200	43
6	503.603	-14.40	39.36	24.96	35.60	-10.64	200	67

- REMARKS:**
1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
 2. Negative sign (-) in the margin column signify levels below the limit.
 3. Frequency range scanned: 30MHz to 1000MHz.
 4. Only emissions significantly above equipment noise floor are reported.

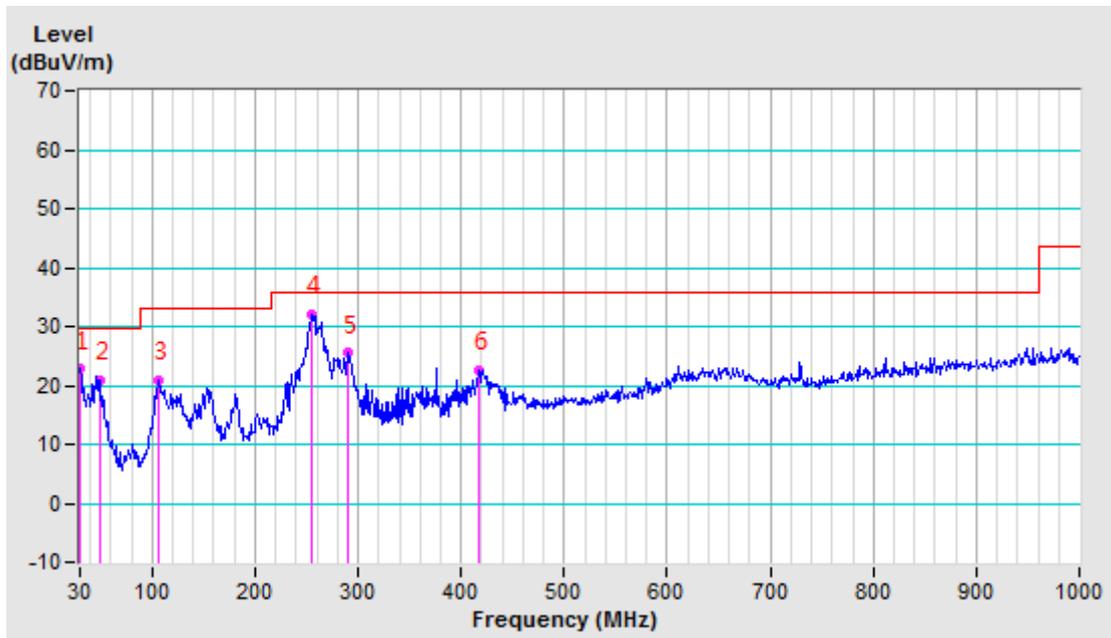




TEST MODE	See section 2.2	FREQUENCY RANGE	30-1000MHz
TEST VOLTAGE	See section 2.2	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	22deg. C, 62% RH	TESTED BY: Bryant	

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 10 M								
No.	Freq. (MHz)	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)
1	30.000	-23.09	45.87	22.78	29.50	-6.72	100	56
2	48.770	-22.02	42.83	20.81	29.50	-8.69	100	200
3	106.973	-24.30	45.24	20.94	33.10	-12.16	100	3
4	255.197	-20.87	53.04	32.17	35.60	-3.43	300	358
5	289.197	-19.45	44.92	25.47	35.60	-10.13	100	26
6	417.631	-16.03	38.62	22.59	35.60	-13.01	100	31

- REMARKS:**
1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
 2. Negative sign (-) in the margin column signify levels below the limit.
 3. Frequency range scanned: 30MHz to 1000MHz.
 4. Only emissions significantly above equipment noise floor are reported.





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4 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please see Attachment 1



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5 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications were made to the EUT by the lab during the test.

---END---